Tutorial
H-1000-5304-01-A

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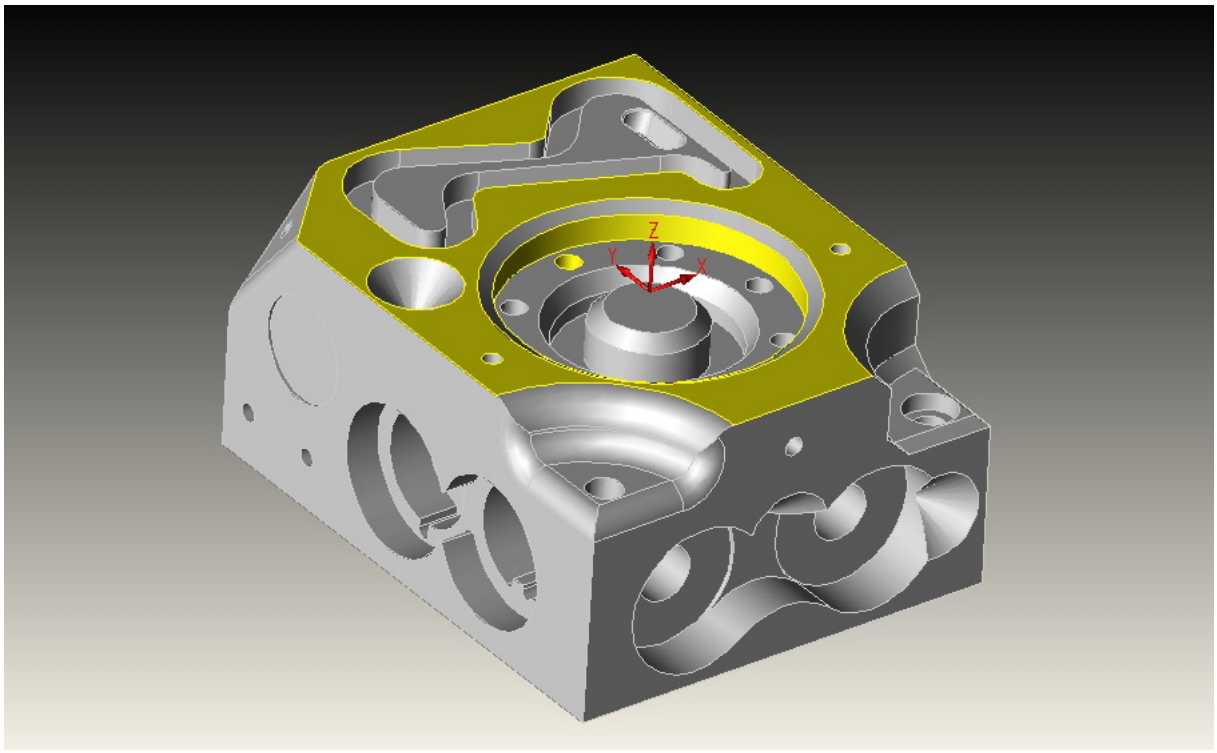
Part alignment - plane and two circles (CAD)



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Renishaw part no: H-1000-5304-01-A

Issued: 12 2013

Part alignment - plane and two circles (CAD)

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Contents

1 Part alignment - plane and two circles (CAD)

1.1 Tutorial pre-requisites

- The student should understand ‘Principles of part alignment’
- The student should have covered ‘Part alignment - plane, line and point’

1.2 Tutorial objectives

- Introduction to feature constructions
- Understand alternative part alignment options

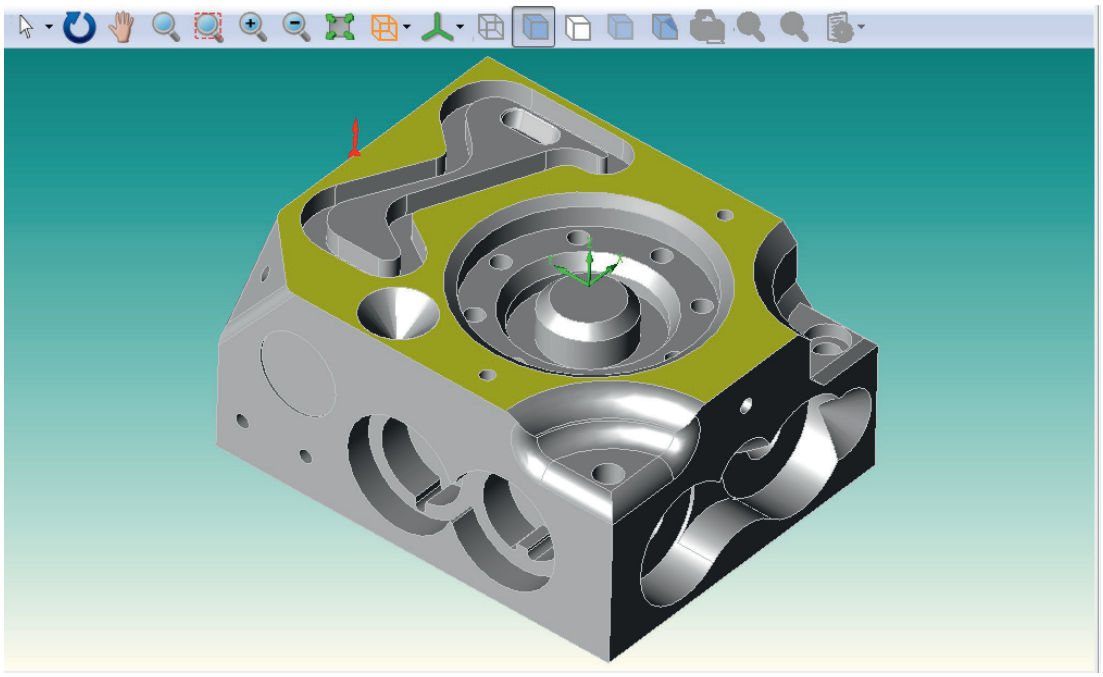
2 Introduction

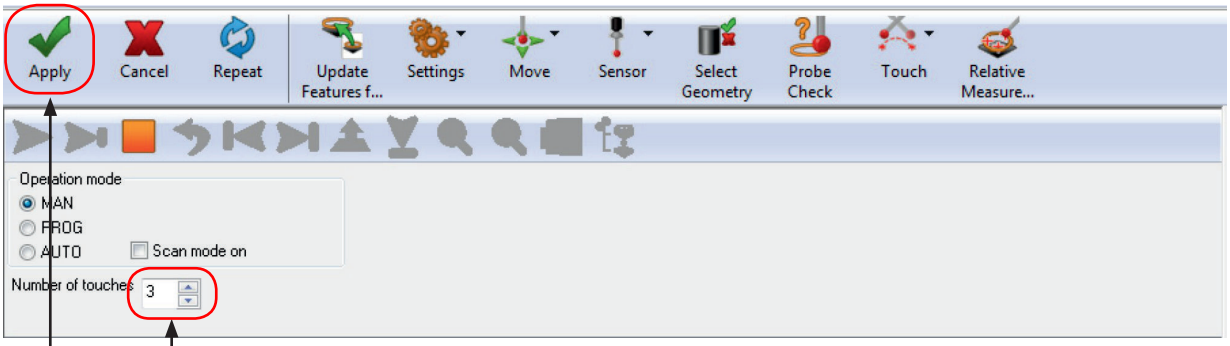
In this tutorial, the Renishaw training block will be used to simulate part alignment requirements controlled by a central boss / bore and timing feature (e.g. a rotating part). All features will be defined and visualised using a CAD model.

3 Manually align component using a CAD model

Firstly, manual alignment operations will be used to provide the rough alignment that is required before automatic alignment can be attempted.

Click on the top face of the CAD model to select it:

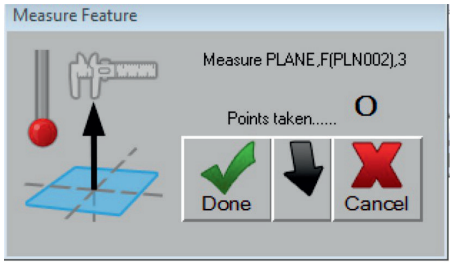




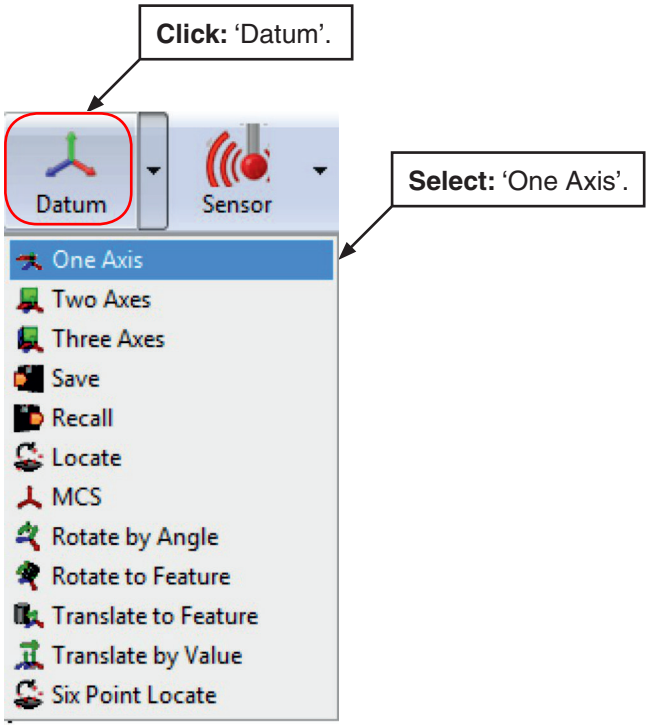
Select the number of points to measure.

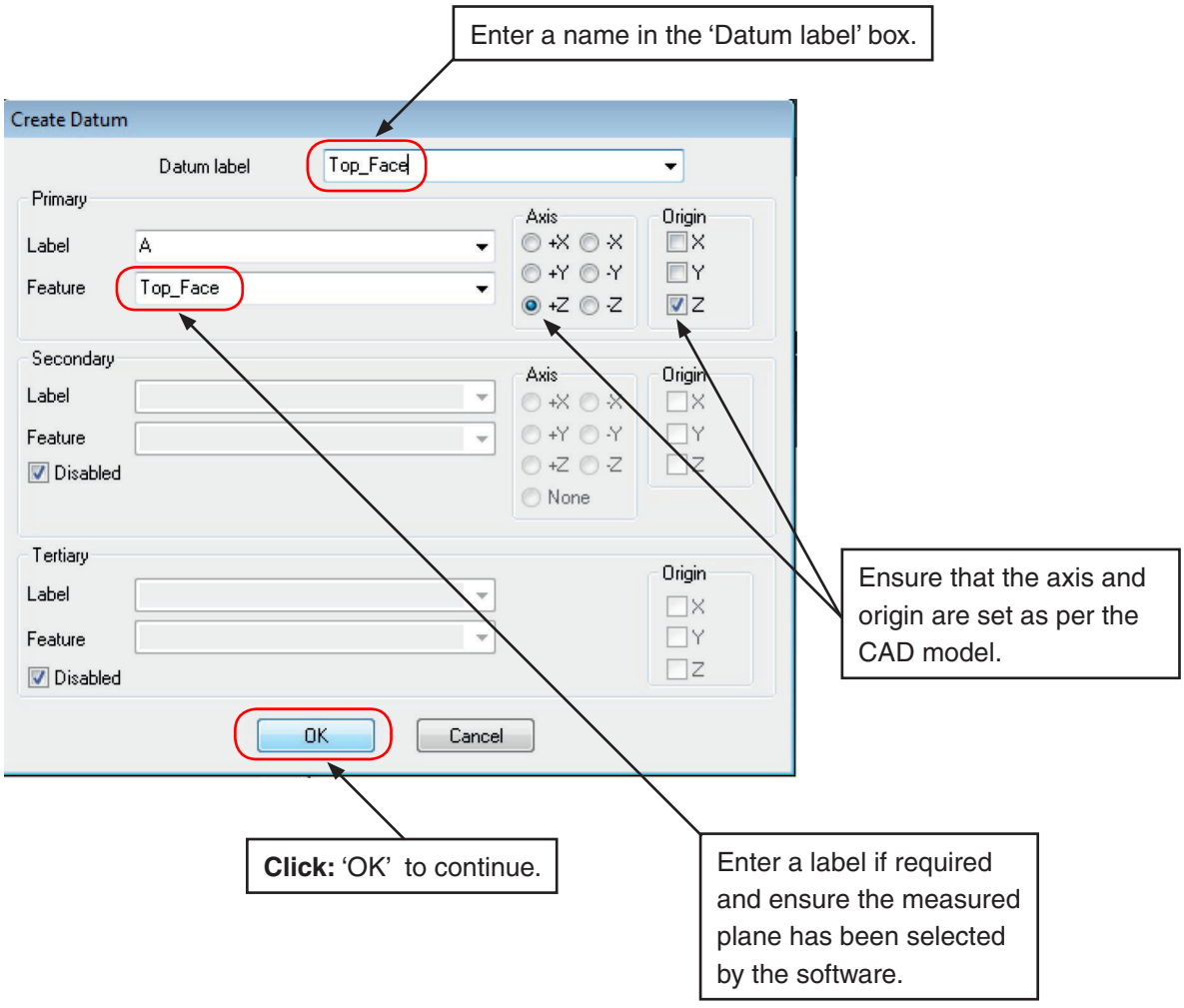
Click: 'Apply'.

Measure the three points:

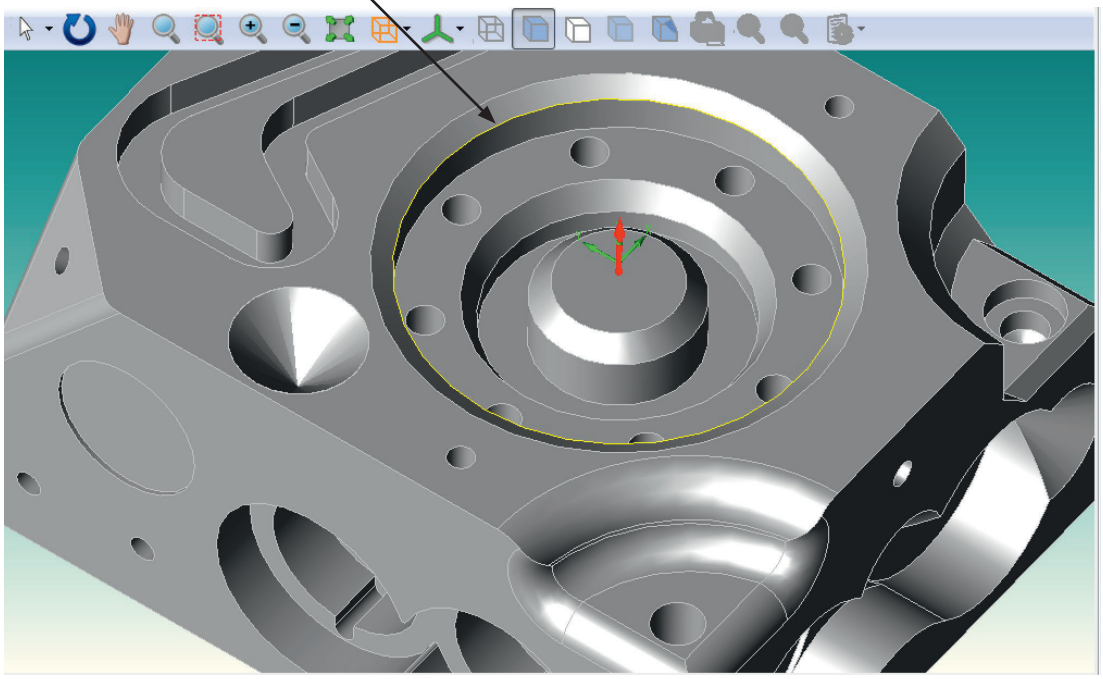


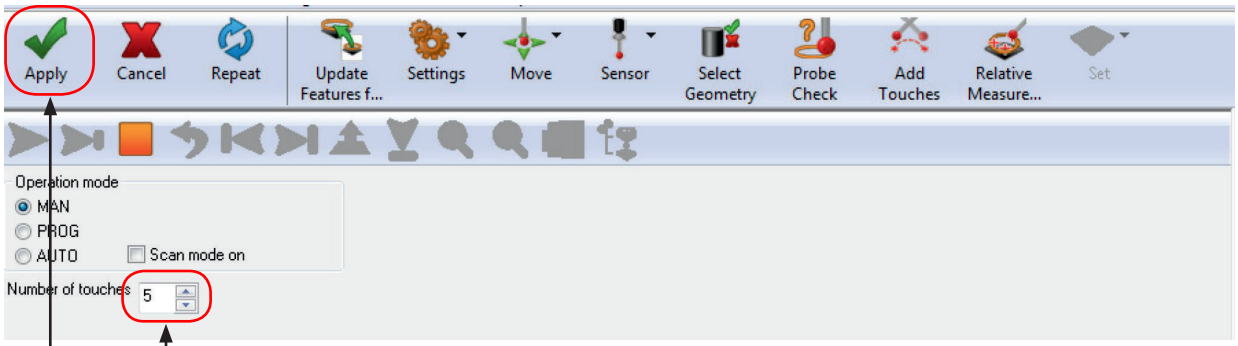
When the plane has been measured:





Click on the top edge of the large bore to select it.

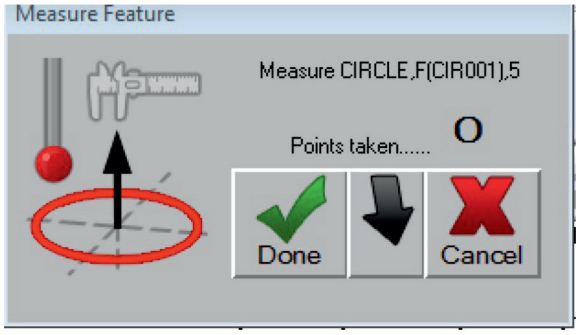




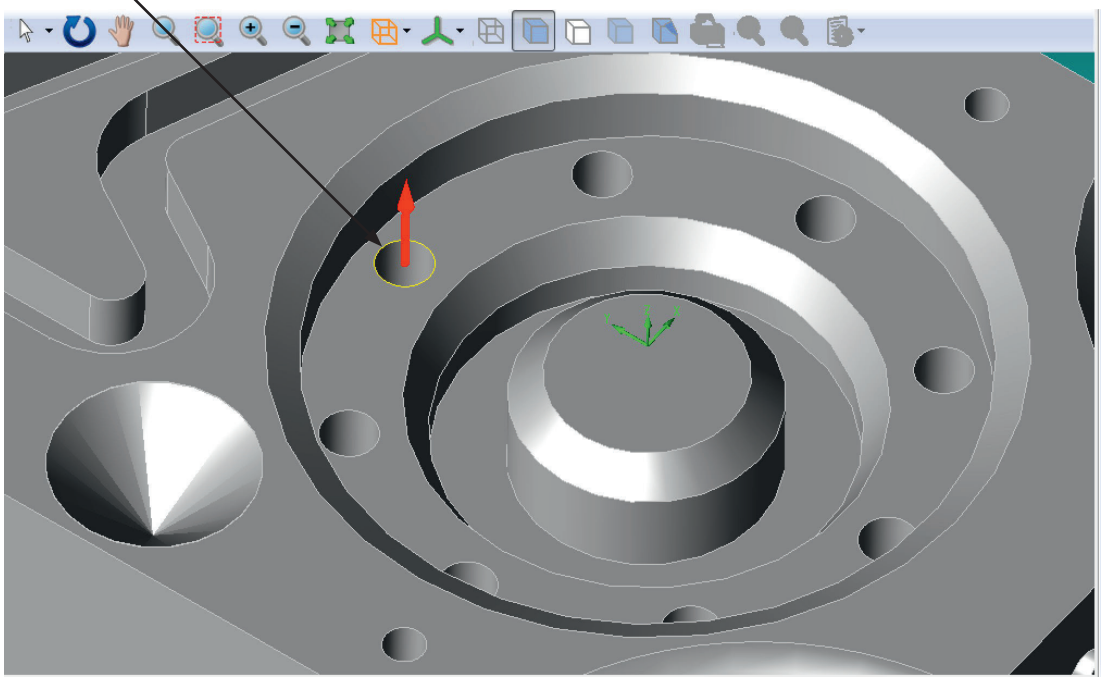
Select the number of points to measure.

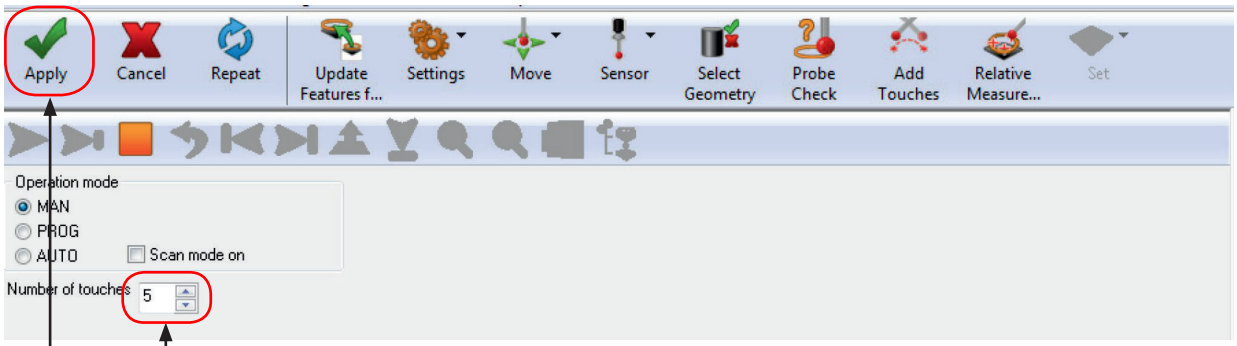
Click: 'Apply'.

Measure the five points:



Click on the top edge of the small bore indicated to select it.

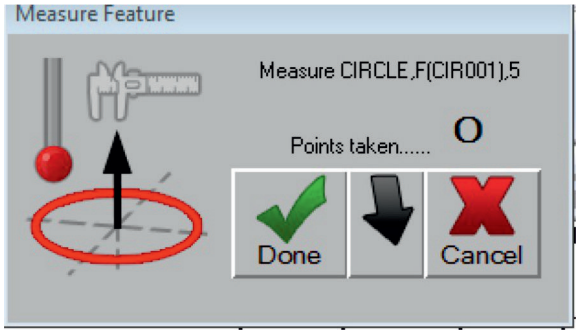


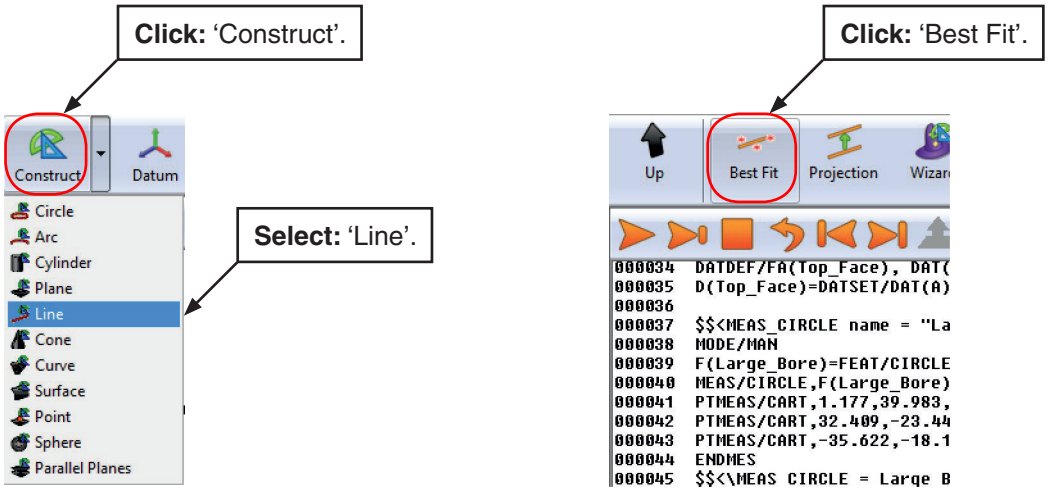


Select the number of points to measure.

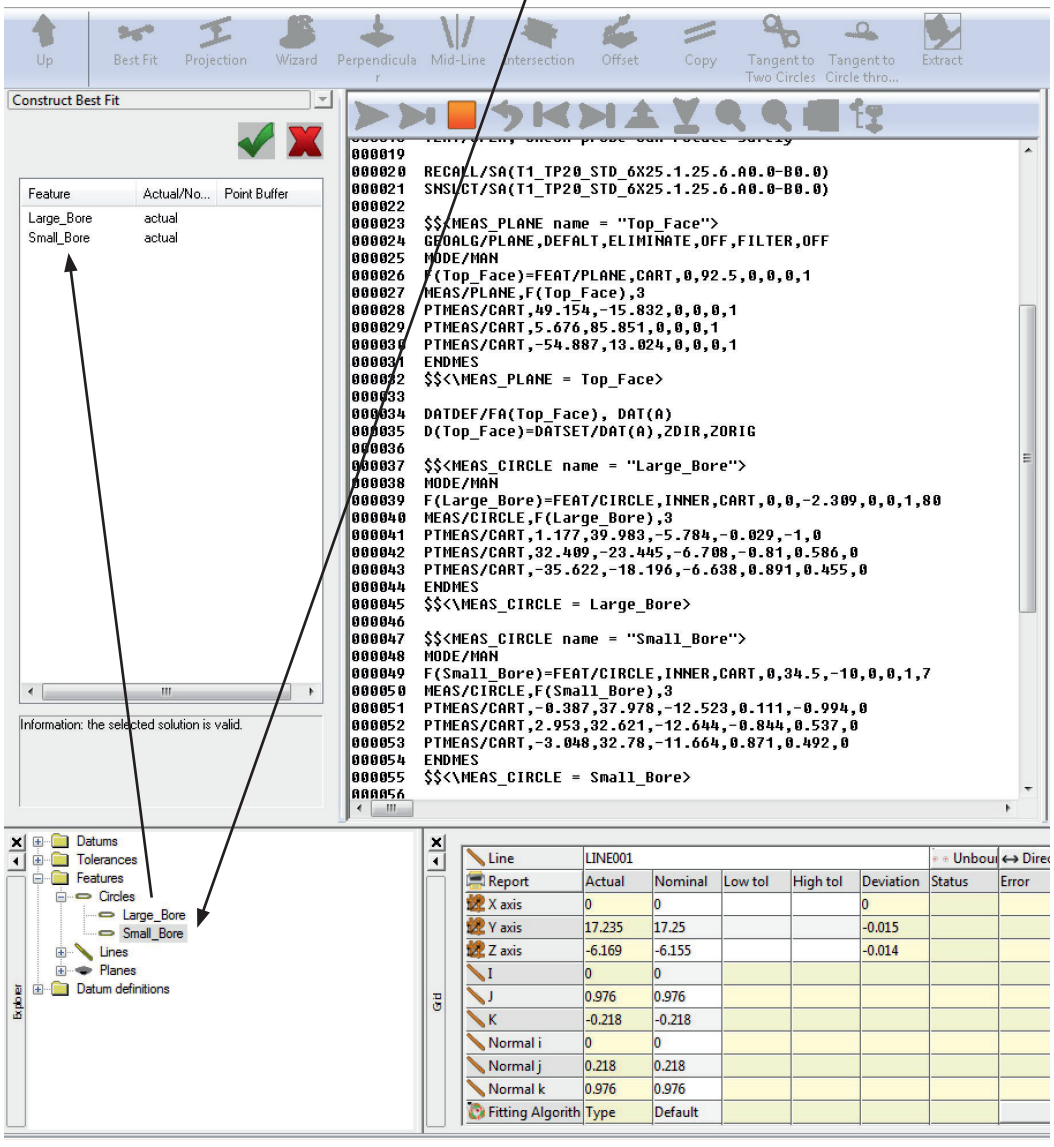
Click: 'Apply'.

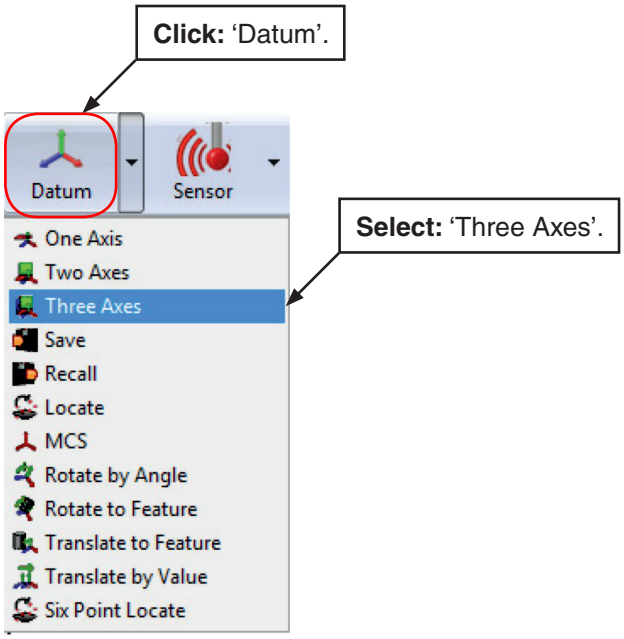
Measure the five points:





When the construction window appears drag the large bore and small bore circles into the construction box. The order these circles are dragged into the box will determine the line direction. In the example shown the direction will run from the large bore to the small bore.

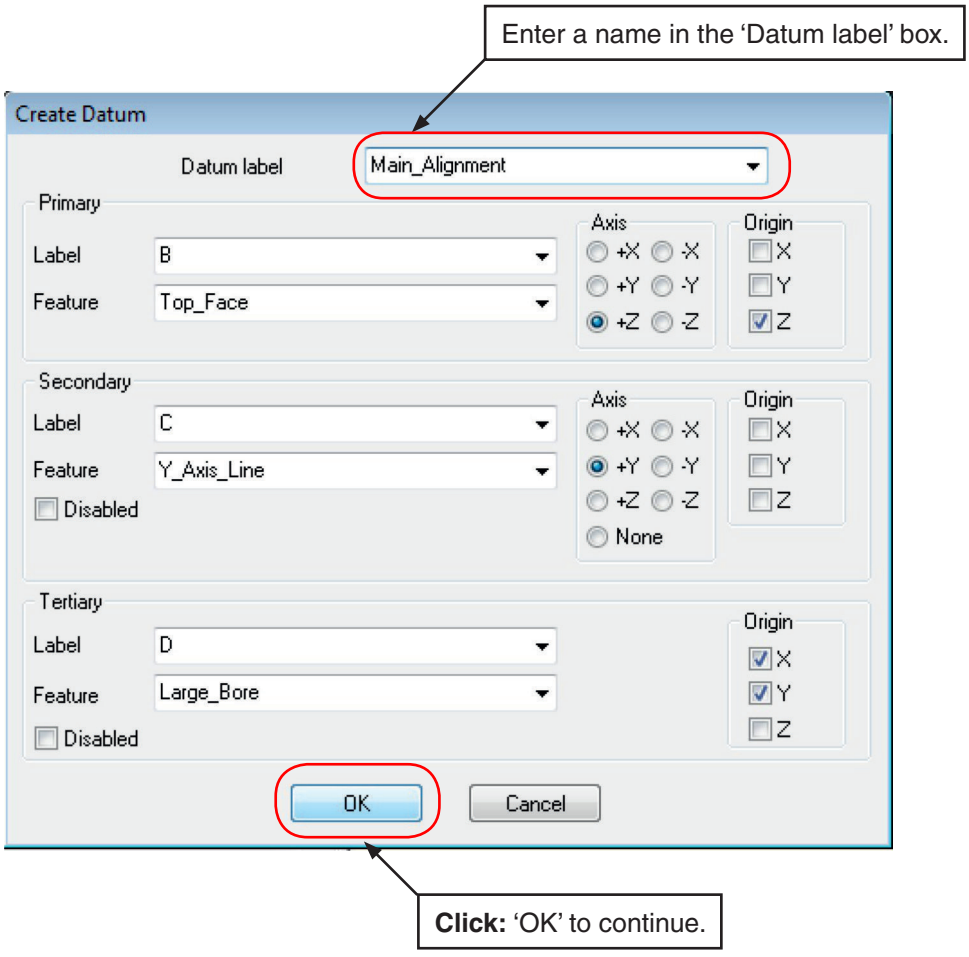


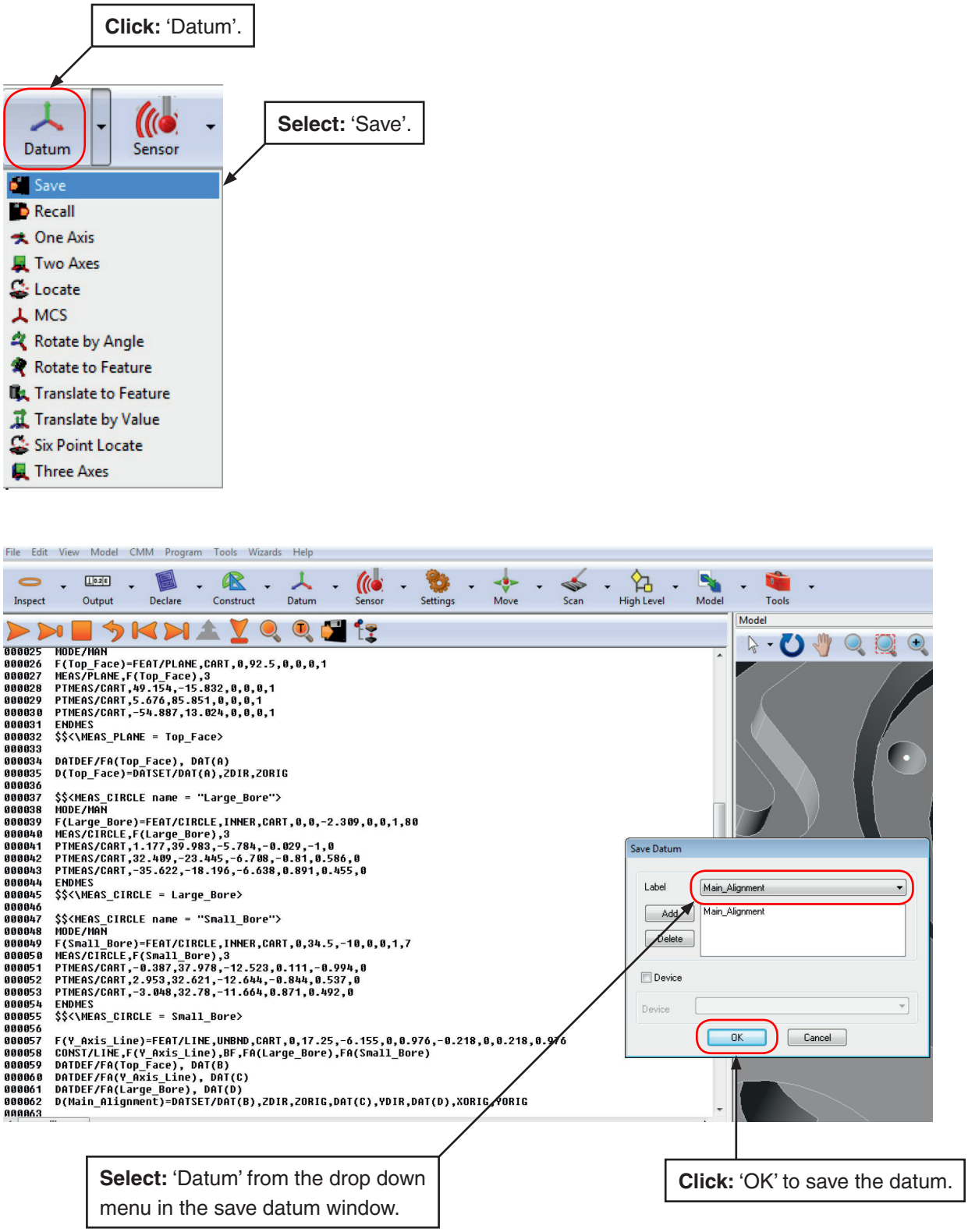


The primary information should be the same as previously created.

Enter the constructed line into the secondary feature box. Enter a label name if required. In this example set the axis to +Y with no origin.

Enter the large bore into the tertiary feature box. Enter a label name if required. In this example tick the X and Y origin boxes.





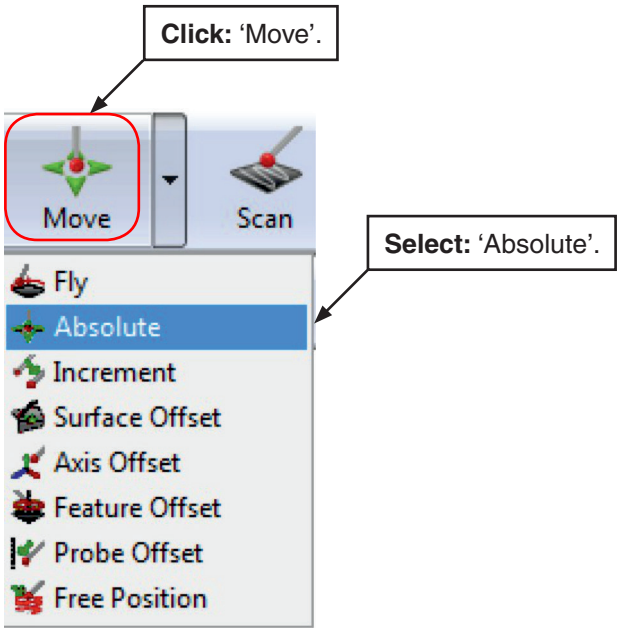
Manual alignment of the component has now been completed. A more precise alignment using the CAD model to obtain nominal measurement data can now be carried out.

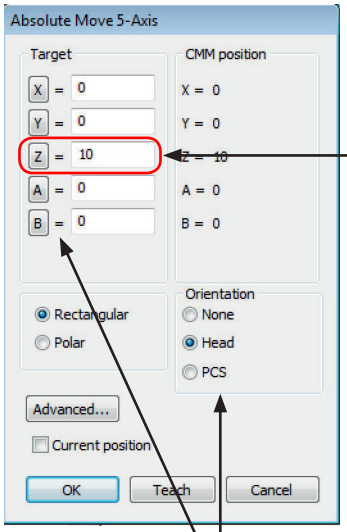
This precise alignment can be carried automatically with no need to take manual points.

4 Automatically align component using a CAD model

The precise alignment can now be completed automatically with no need to take manual points.

Set the program mode to ‘MODE/PROG,MAN’ then move the probe to a position directly above the component.

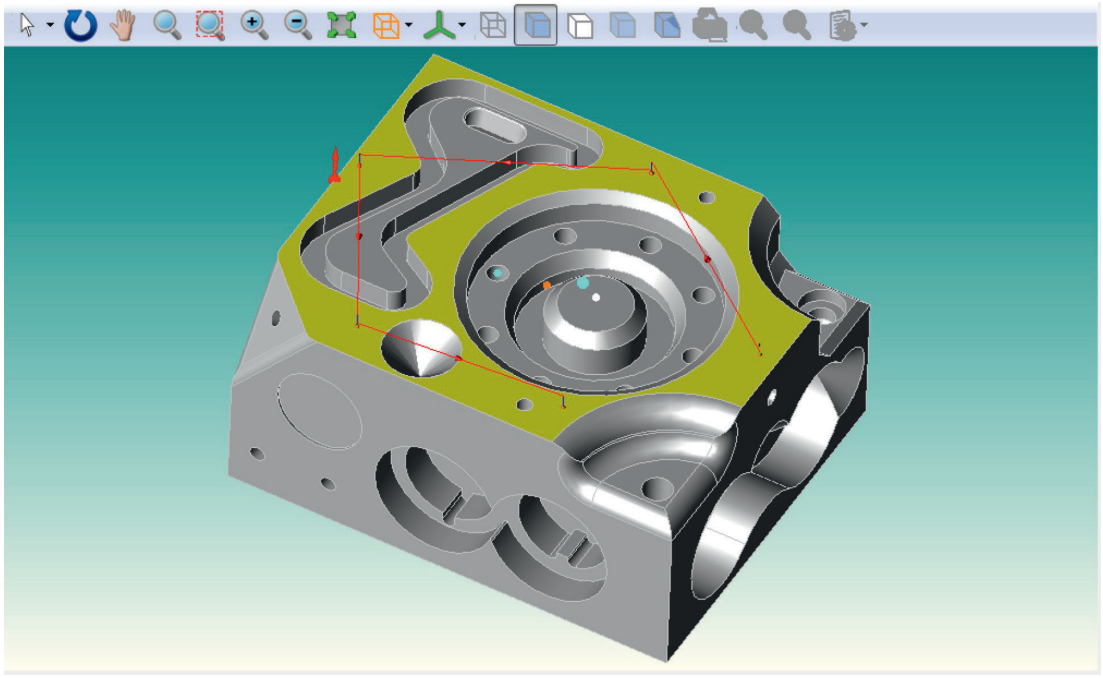




Enter the figures to position the probe an appropriate distance above the centre of the component.

At this stage do not enter any figures into the A and B boxes and do not change the orientation.

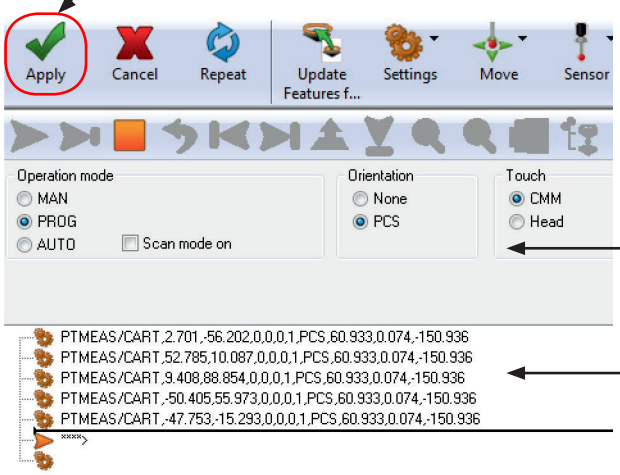
Click on the top face of the CAD model to select it. Next click on the face where the points are to be measured:



Plane	PLN002						
Report	Actual	Nominal	Low tol	High tol	Deviation	Status	Error
X axis	0	0			0		
Y axis	92.5	92.5			0		
Z axis	0	0			0		
I	0	0					
J	0	0					
K	1	1					
Flatness							
Rounding	Lengths	1	Angles	1	Directions	1	Disabled
Fitting Algorith	Type	Default					Disabled
Elimination Filt	STD Devs	3.000000					Disabled

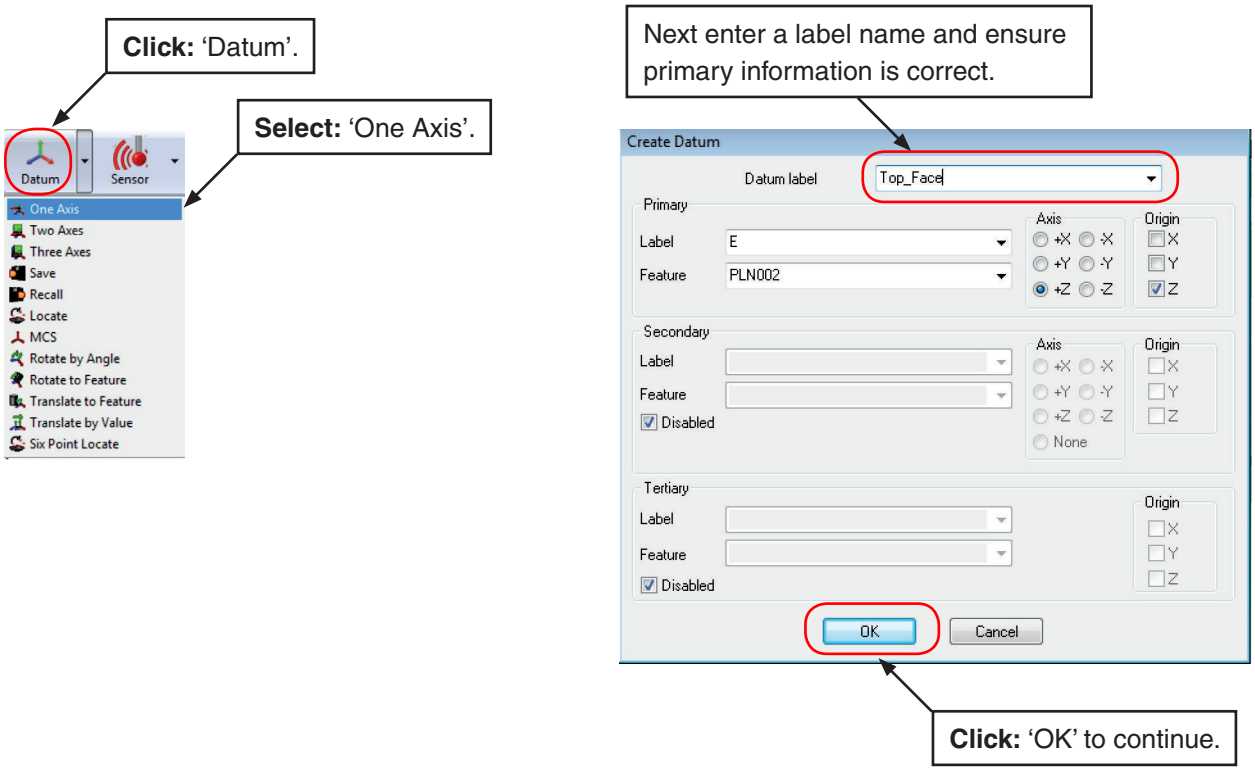
Having selected the feature to be measured, the nominal data is automatically entered into the feature box.

Click: 'Apply' to continue.



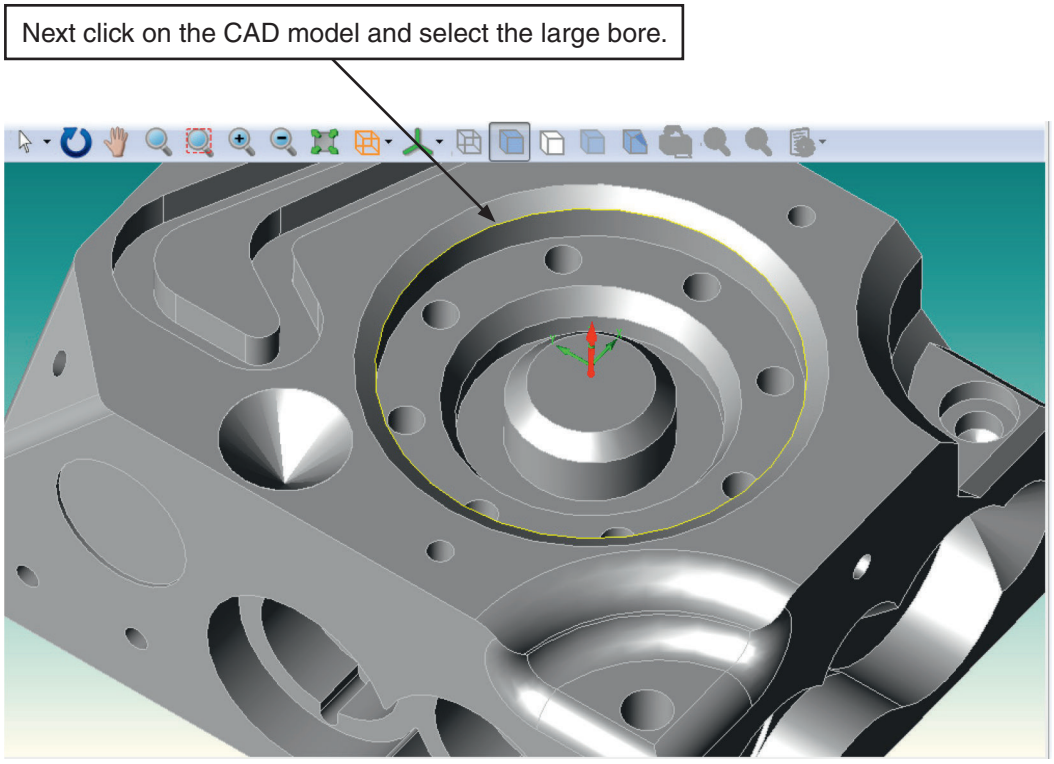
Ensure that 'PROG', 'PCS' and 'CMM' are selected.

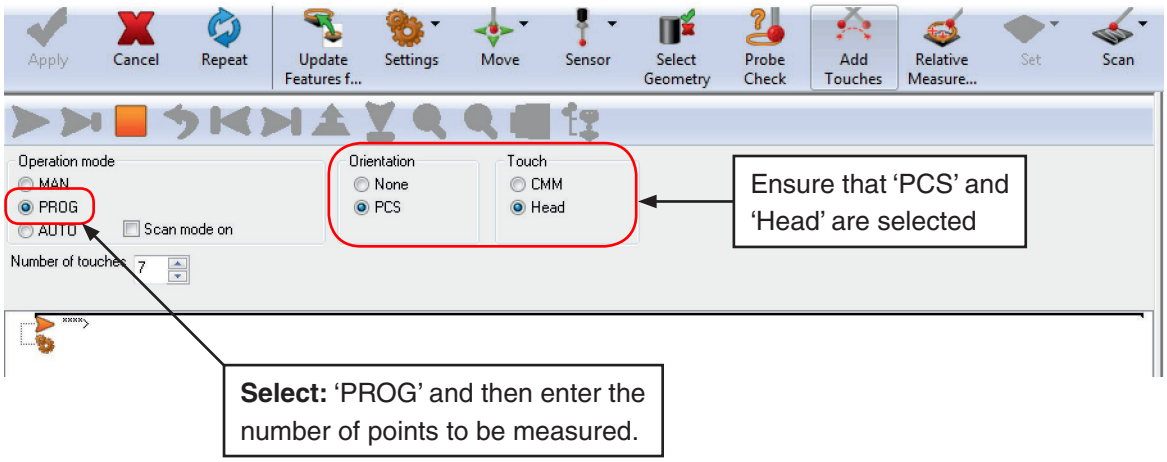
Point data displayed here.

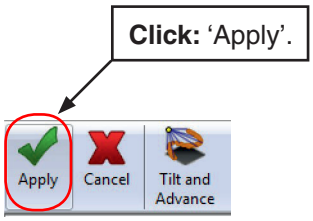


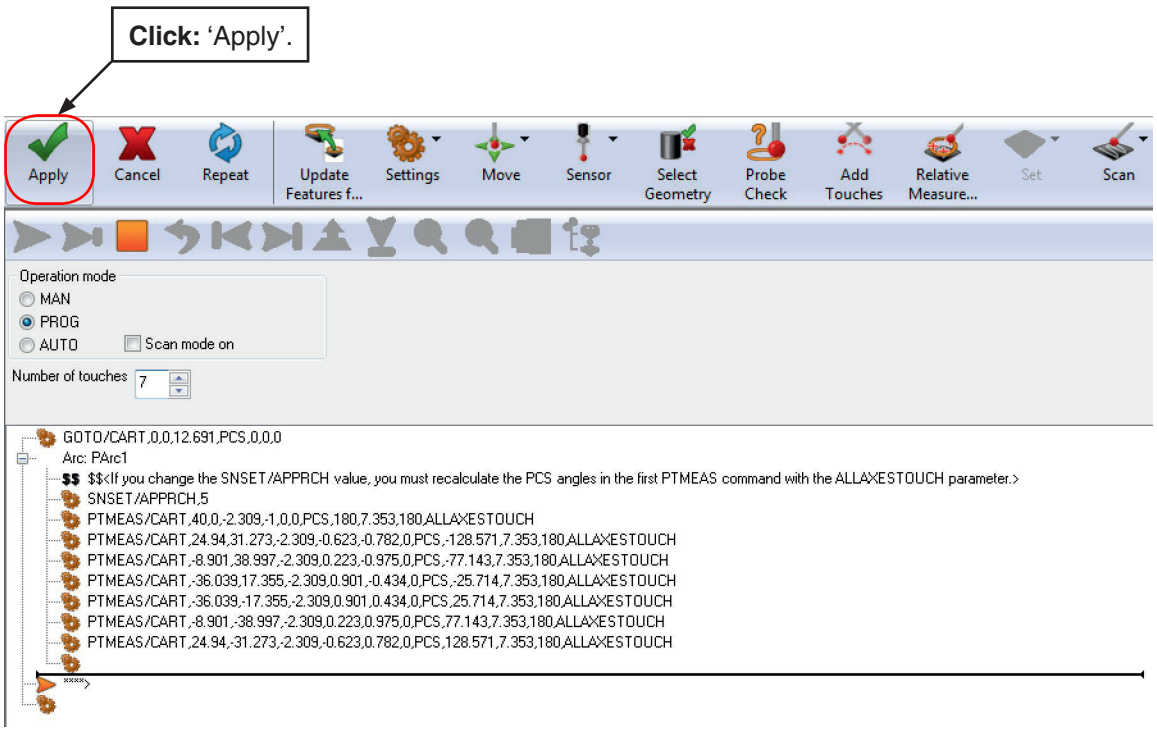
NOTE: In all of the following measurement steps within this tutorial, it must be ensured that suitable GOTO points are added as required and that all settings functions (approach, retract, depth, clearance and search etc.) are adjusted to suit.

Before measuring the following bores make sure the required 'Depth' has been set in 'Settings'.

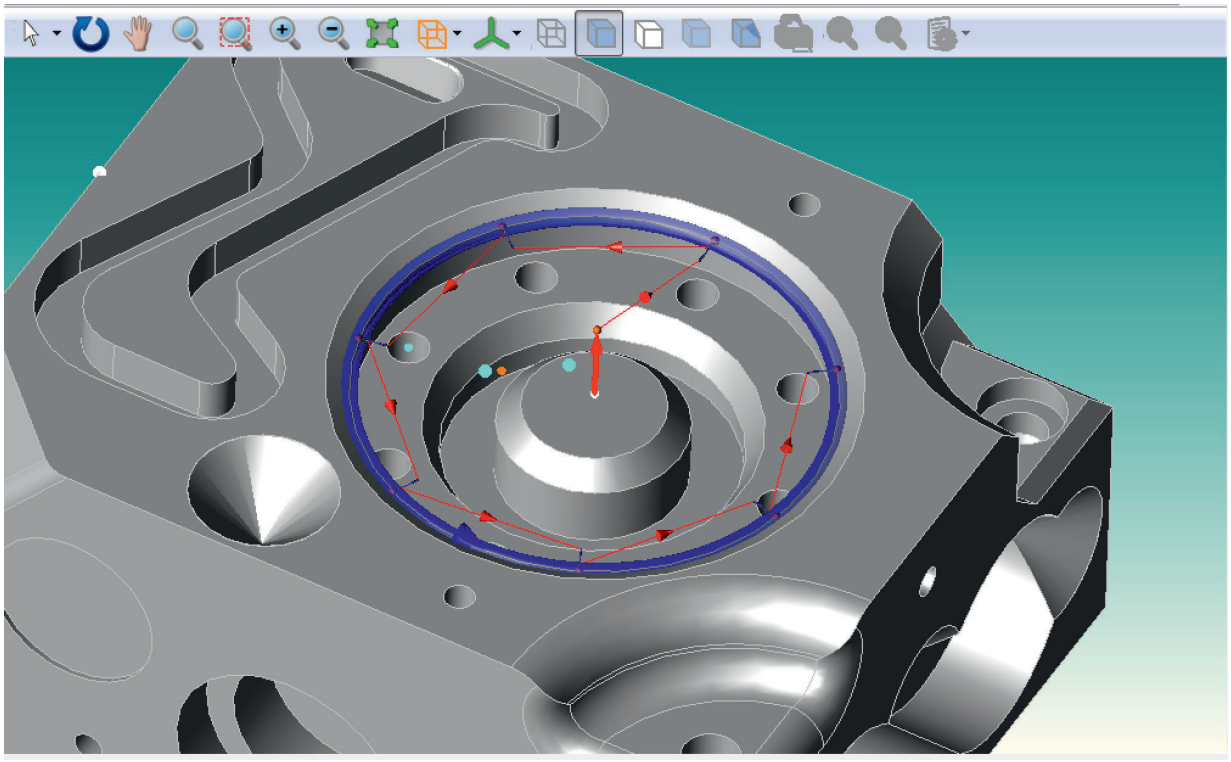



Apply
Cancel
Repeat
Update Features f...
Settings
Move
Sensor
Select Geometry
Probe Check
Add Touches
Relative Measure...
Set
Scan
Operation mode
MAN
PROG
AUTO
Scan mode on
Number of touches
7
Orientation
None
PCS
Touch
CMM
Head
Ensure that 'PCS' and 'Head' are selected
Select: 'PROG' and then enter the number of points to be measured.

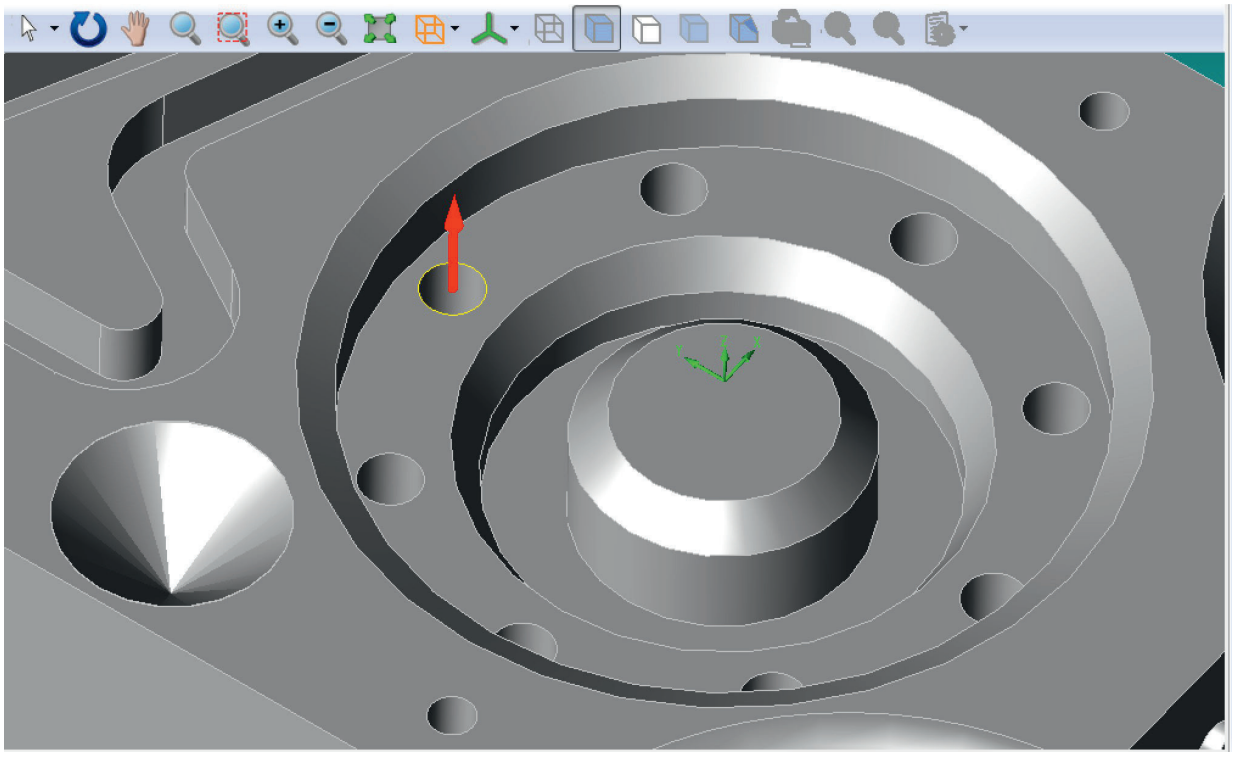

Click: 'Apply'.
Apply
Cancel
Tilt and Advance


Click: 'Apply'.
Apply
Cancel
Repeat
Update Features f...
Settings
Move
Sensor
Select Geometry
Probe Check
Add Touches
Relative Measure...
Set
Scan
Operation mode
MAN
PROG
AUTO
Scan mode on
Number of touches
7
GOTO/CART,0,0,12.691,PCS,0,0,0
Arc: PArc1
$$ $$<If you change the SNSET/APPRCH value, you must recalculate the PCS angles in the first PTMEAS command with the ALLAXESTOUCH parameter.>
SNSET/APPRCH,5
PTMEAS/CART,40,0,-2.309,-1,0,0,PCS,180,7.353,180,ALLAXESTOUCH
PTMEAS/CART,24.94,31.273,-2.309,-0.623,-0.782,0,PCS,-128.571,7.353,180,ALLAXESTOUCH
PTMEAS/CART,-8.901,38.997,-2.309,0.223,-0.975,0,PCS,-77.143,7.353,180,ALLAXESTOUCH
PTMEAS/CART,-36.039,17.355,-2.309,0.901,-0.434,0,PCS,-25.714,7.353,180,ALLAXESTOUCH
PTMEAS/CART,-36.039,-17.355,-2.309,0.901,0.434,0,PCS,25.714,7.353,180,ALLAXESTOUCH
PTMEAS/CART,-8.901,-38.997,-2.309,0.223,0.975,0,PCS,77.143,7.353,180,ALLAXESTOUCH
PTMEAS/CART,24.94,-31.273,-2.309,-0.623,0.782,0,PCS,128.571,7.353,180,ALLAXESTOUCH

The CMM will now measure the large bore:



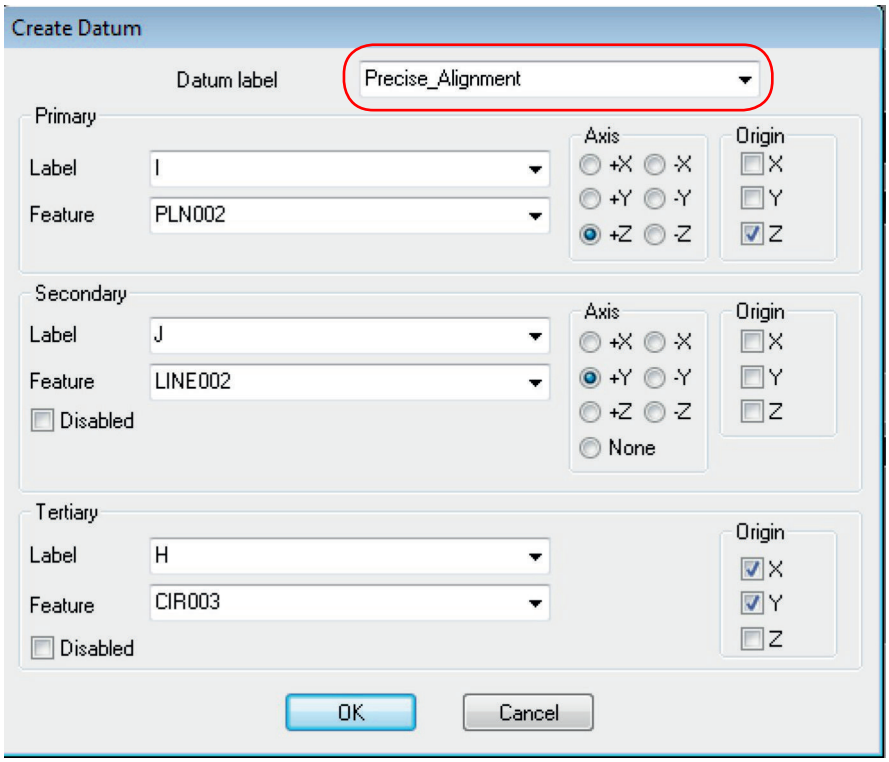
Next click on the CAD model and select the small bore:



This small bore should now be measured using the same method as the large bore above.

Construct a line using the two CNC measured circles (CIR003 and CIR004)

Next complete the precise alignment using the large and small bores and save this new alignment with the label ‘Precise_Alignment’:



The component has now been precisely aligned using a fully automated measurement process, removing the subjectivity associated with touch points in a manual alignment.

Further measurement of the component can now be undertaken.

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